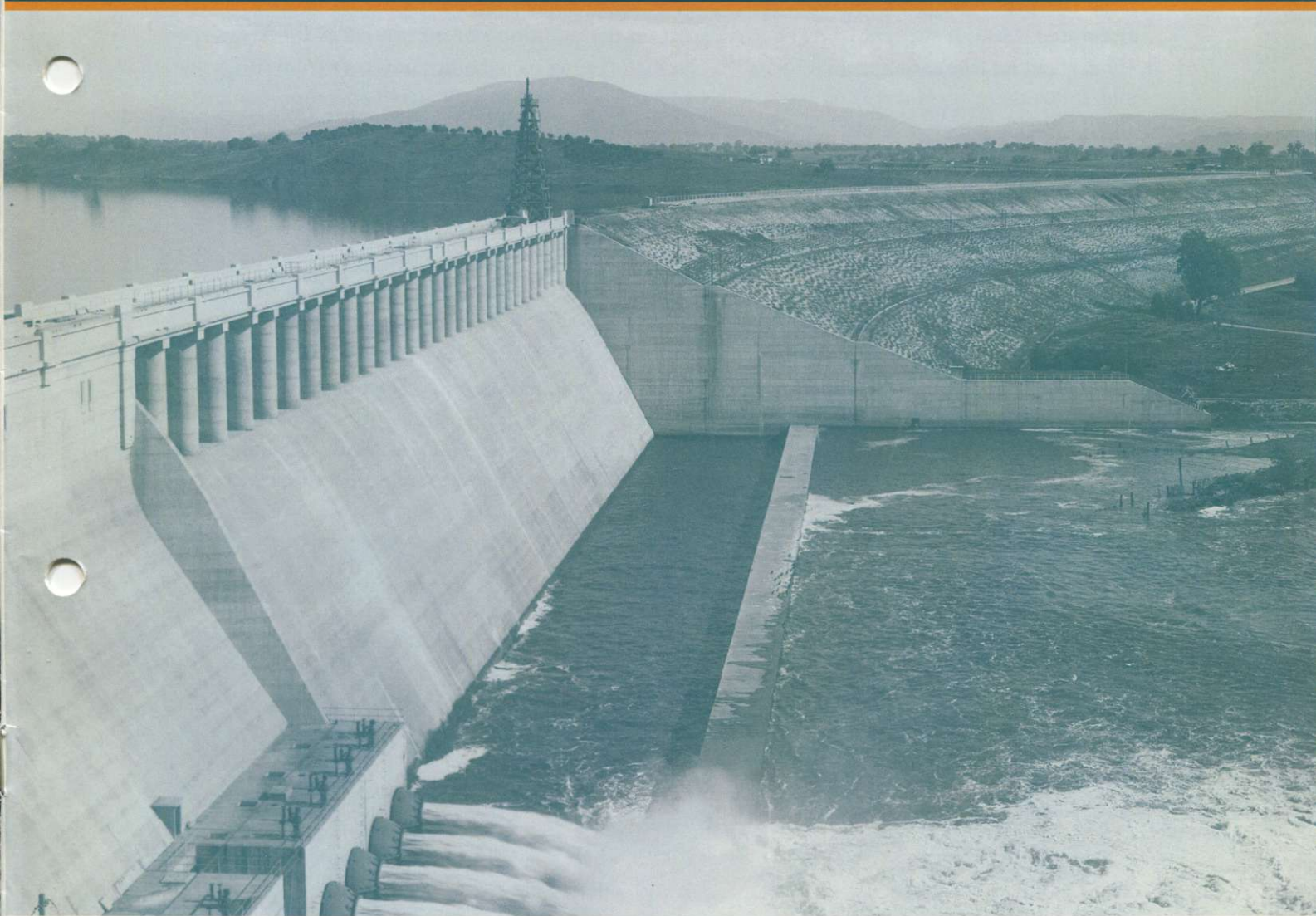
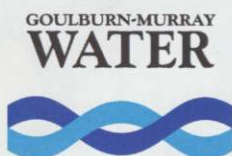


The Engineering Works of the River Murray

An official ceremony to commemorate the
Engineering Works of the River Murray
as a National Engineering Landmark



Above: Hume Dam - circa 1936



History

For many thousand of years Aboriginal people have inhabited the Murray Valley.

Whilst European influence only commenced in the early 1800s, its impact over the past 175 years has been dramatic.

In 1853 the first paddle steamers commenced operation on the River Murray from Goolwa, developing trade links up the Murray to Echuca, the Darling to Walgett and the Murrumbidgee to Hay.

From the 1860s the three states of New South Wales, Victoria and South Australia had attempted, without success, to reach agreement on the utilisation of the waters of the River Murray and its tributaries. Initial focus was on maintaining navigability, however from the mid 1880s there was increasing interest in irrigation. It was not until after Federation that any significant progress was made.

The Corowa Water Conference of May 1902 resulted in the establishment of the *Interstate Royal Commission of the River Murray - 1902*. The conclusions and recommendations of the Royal Commission were not unanimous (South Australia dissented because it was not satisfied that navigation had been given due prominence), however the recommendations would form the basis of the later agreement. Notwithstanding the divergent views of the three states there was recognition that a "friendly approach" in the "spirit of conciliation and harmony" was essential.

Negotiations progressed without any agreement being reached until in 1911 the Premiers made significant progress. NSW and Victoria agreed to give South Australia permission to construct works at Lake Victoria, to assist in regulation of flows to South Australia. In addition the Premiers agreed to instruct the engineers of their three states to jointly report on the question of the River Murray and its tributaries. The three engineers of note were EM de Burgh (NSW), JS Dethridge (Victoria) and G Stewart (South Australia).

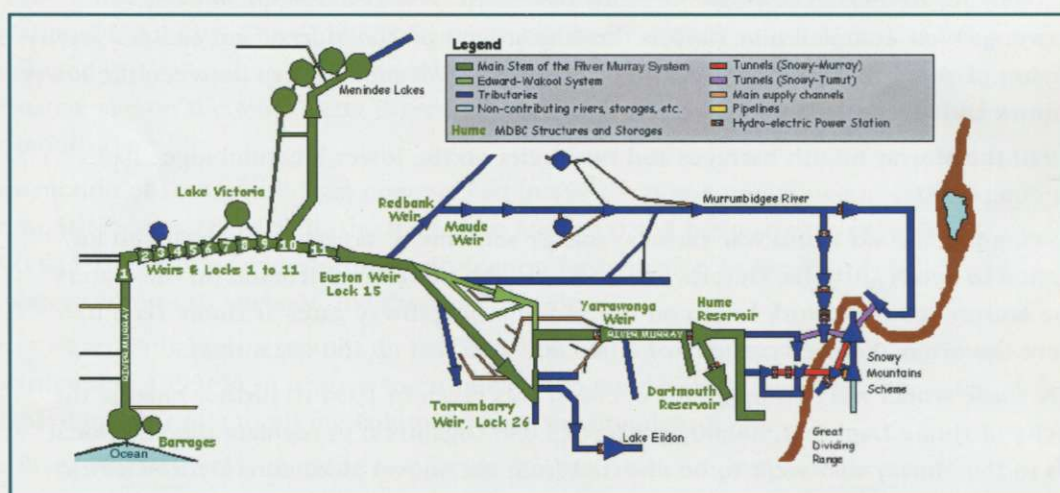
The Conference of Engineers Report was completed in July 1913 and subsequently formed the basis of the River Murray Waters Agreement of 9 September 1914. The Agreement forms part of the River Murray Waters Act of 1915, which was passed by the Commonwealth, NSW, Victorian and South Australian Parliaments.

Below: Bulk Earthmoving - Lake Victoria



The Agreement, which is a schedule to the Act, provided for the construction of the following works:

- A storage on the upper Murray
- A storage at Lake Victoria
- 26 weirs and locks on the Murray from Blanchetown to Echuca
- 9 weirs and locks on the Murrumbidgee from its junction with the Murray to Hay, or alternatively on the Darling, from its junction with the Murray (NSW chose the Murrumbidgee).



Construction

Even before finalising the Agreement, South Australia had (in 1912) commenced design of the series of locks and weirs. Captain EN Johnston of the United States Army Corps of Engineers was engaged for this task. By 1913 construction of Lock 1 at Blanchetown had commenced. Delayed by World War 1, this lock was not completed until 1922.

Construction of Hume Dam commenced in 1919 with the concrete spillway section being constructed by NSW and the earthen embankments by Victoria. A difficult industrial environment existed on the project with separate workforces housed in separate camps, one on each side of the river and subject to quite different terms and conditions of employment. Uncertainty over the design capacity of the reservoir saw construction proceed until 1926, before the capacity was finally confirmed at 2.0 million acre feet (2,460 GL). Financial problems of the Great Depression resulted in the Governments instructing the builders to limit construction to 1.25 million acre feet (1,542 GL), without restricting ultimate design capacity. Construction was completed in 1936.

The 1920s and 1930s was a period of dramatic change along the River Murray as many of the various works were progressively completed.

With further development of rail networks, the use of the river as a major transport route had progressively declined and by the 1930s, had virtually ceased. The Agreement was amended in 1934 to:

- Reduce the number of weirs and locks on the Murray from 26 to 14 (including Yarrawonga Weir, but with no lock).
- Replace 9 locks and weirs on the Murrumbidgee with two diversion weirs.
- Provide for construction of barrages in the Goolwa, Boundary Creek, Mundoo, Ewe Island and Tauwitchere Island Channels near the Murray mouth.

Yarrawonga Weir, completed in 1939, is the largest weir on the Murray and enables gravity diversion of water to the Finley-Deniliquin region in NSW and the area between the lower Goulburn and Murray Valley in northern Victoria.

By 1940 the Murray mouth barrages and two weirs on the lower Murrumbidgee had been completed.

Following the Second World War various "soldier settlement" areas were developed for irrigation in South Australia, Victoria and NSW, placing increasing demand on the waters of the Murray. In 1950 work began on the addition of spillway gates at Hume Dam to achieve the original design capacity of 2,000,000 acre feet (2,460 Gigalitres).

Before these works were completed a decision was taken in 1954 to further enlarge the capacity of Hume Dam to 2,500,00 acre feet (3,038 Gigalitres) to regulate the additional flows to the Murray that were to be diverted from the Snowy Mountains Hydro-Electric Scheme. Whilst the crest level of the main embankment was not increased a concrete parapet wall was added to protect the embankment from overtopping wave action. A range of other works included raising the spillway crest 1.2m, rock stabilisation on the upstream side of the main embankment, construction of an additional saddle dam (Embankment 3), installation of post tensioning cables in the concrete spillway, as well as installation of 29 spillway gates. In addition, the town of Tallangatta was relocated to a new flood free site and the Bethanga Bridge was raised.

Below: Hume Dam - 2001



Following the first filling of Hume Dam in 1939-40, the effects of reservoir drawdown caused substantial slumping of the upstream face of Bank No. 1 and the displacement of many facing slabs. Over the past 60 years Hume Dam has endured a series of remedial works in addition to the enlargement works of the 1950s.

Since 1995 a \$75 million remedial works program has been underway and is due for completion in 2002. Notwithstanding all these works, studies are continuing into the question of what spillway capacity is required to satisfy contemporary design standards and further upgrades of spillway capacity may be implemented in the future.

By 1960 it had become apparent that an additional water storage was needed to provide more operational flexibility. The Chowilla Dam site had been chosen near Renmark but this was abandoned in 1967 due to concerns about construction cost, evaporation and salinity. An alternative site on the Mitta Mitta River in north eastern Victoria was then developed for the Dartmouth Dam.

Construction of Dartmouth Dam commenced in 1972 and was completed in 1979. Dartmouth Dam is 180m high (the highest in Australia) and has a storage capacity of 4,000 GL. The Dam provides drought protection for irrigation in the Murray Valley and for water supplies to Adelaide and the Iron Triangle.

The most recently built structure on the Murray River is Torrumbarry Weir which was constructed in 1995/96 to replace the original steel trestle, Dethridge Weir, which had partly collapsed in 1992 due to piping failure through the foundation.

The River Murray Works continue to provide the basic functions of water regulation, diversion, salinity control and navigation that they were originally intended to provide when first conceived 100 years ago. In relation to navigation there is no longer any freight transport on the river however a significant tourist and recreational use of the river endures, continuing demand for use of the locks.

Below: Dartmouth Dam



The Engineers Responsible for the River Murray Works

Until the 1970s the River Murray Commission was comprised of a President, being a Minister of the Commonwealth Government, a senior officer of the Commonwealth as Deputy Commissioner and one Commissioner from each of the three states. Many of the Commissioners and Deputy Commissioners were eminent engineers, who headed the relevant Constructing Authorities and were responsible for implementation of a broad range of other works in their own jurisdictions.

The longer serving Commissioners or Deputy Commissioners through the construction era from 1917 through to the late 1970s were:

Commonwealth	NSW	Victoria	South Australia
T Hill	HH Dare	JS Dethridge	JHO Eaton
CA Hoy	FH Brewster	RH Horsfield	JR Dridan
LF Loder	CC Corbett	LR East	HL Beaney
TA O'Brien	AF Reddoch	RA Horsfall	RJ Shannon
	JB Cunneen	WE Bromfield	

In addition in 1951 the River Murray Commission appointed GL Harrison as executive engineer, to be responsible for operations and to direct the asset management program. Remarkably only three other engineers, KE Johnson, DJ Blackmore and DJ Dole, would fill the position over the next 50 years, including following the creation of the Murray-Darling Basin Commission. Their long and dedicated service reflects the special attraction of the River Murray, its assets and the people who operate them.

The River Murray Works are still functioning today, almost a century since first conceived and nearly eighty years after construction. They stand as a testament, not only to the engineers who investigated, designed and built them, but equally to the four or more subsequent generations of engineers and operating personnel who have monitored, maintained, repaired and refurbished them.

Below: Blanchetown Weir - today



The Murray-Darling Basin Commission

The Murray-Darling Basin Commission is the inter-government body responsible for managing the water of the River Murray and lower Darling, advising on policies and programs for the management of the Murray-Darling Basin's land, water and environmental resources and for overseeing the implementation of policies and programs aimed to help achieve their sustainable use.

The Commission is chaired by an independent President and comprises Commissioners from the six governments responsible for the Murray-Darling Basin. There are two Commissioners from each of the Commonwealth, New South Wales, Victoria, South Australia and Queensland and one from the Australian Capital Territory.

The Commission is empowered by the Murray-Darling Basin Agreement, which is underpinned by legislation in each of the six partner governments. The Commission is supported by an Office whose staff are appointed under the Agreement.

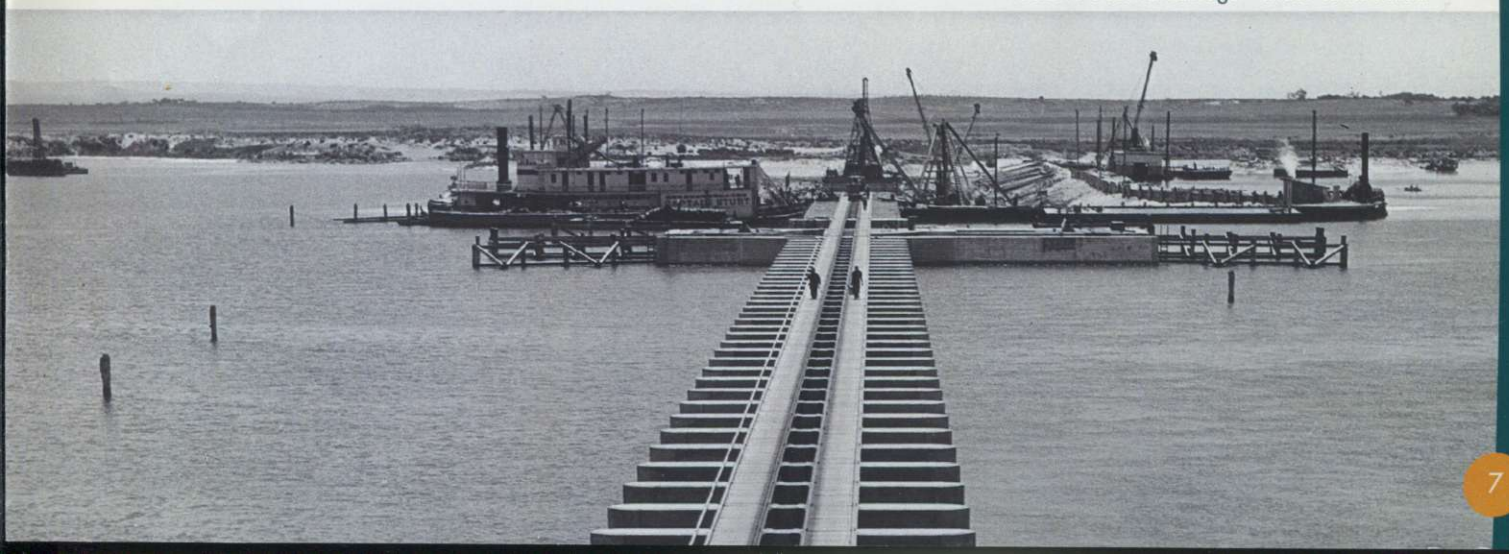
The Commission is accountable to the Murray-Darling Basin Ministerial Council, which comprises Ministers who represent land, water and environment responsibilities in each of the partner governments. The Council comprises up to three Ministers from each of the Commonwealth and four state governments and a single Minister from the ACT.

The Commission works closely with the Murray-Darling Basin Community Advisory Committee, which is appointed by the Ministerial Council. The Committee comprises a Chairman, twenty-one members representing catchments or regions within the Basin, four members representing special interest peak organisations and an indigenous member.

Under the Agreement, Constructing Authorities are appointed by each contracting State Government to investigate, design, construct, operate and maintain the various works, directed by the Commission's water business, River Murray Water. The three organisations currently responsible for the River Murray Works are:

- | | |
|-------------------|---|
| • New South Wales | Department of Land and Water Conservation |
| • Victoria | Goulburn-Murray Water |
| • South Australia | SA Water Corporation |

Below: Goolwa Barrage - under construction



The Australian Historic Engineering Plaquing Program

The Institution of Engineers, Australia's Historic Engineering Plaquing Program recognises engineering items of both local and national significance. The Program is managed by

Engineering Heritage Australia, the Institution's peak heritage body.

The highest award of National Engineering Landmark is reserved for works of outstanding importance; works that have made a major contribution to the development of Australia and represent a benchmark by which progress is measured.

These works are not only part of Australia's engineering heritage, but are also significant components of the national estate.



Above: Yarrawonga Weir

Plaque Inscription - Hume Dam

THE ENGINEERING WORKS OF THE RIVER MURRAY

The inter-governmental conference on the waters of the River Murray at Corowa in 1902 gave rise to one of the great engineering initiatives of the new Federation. The creation of the River Murray Commission in 1916 by the governments of the Commonwealth, New South Wales, South Australia and Victoria established the framework under which the four governments would work together for the equitable, efficient and sustainable use of the waters of the River Murray. A comprehensive scheme of works, comprising Hume and Dartmouth Dams, Lake Victoria and a series of locks, weirs and barrages from Yarrawonga to the Murray mouth, has been constructed to support irrigation, urban water supply, hydro-electric generation, navigation, recreation and flood mitigation.

Their purpose continues to be to contribute to human welfare.

The challenge remains for current and future generations to ensure that continuing operations sustain the health of the river's ecological community.

Other plaques are at Yarrawonga and Blanchetown weirs.

Dedicated by The Institution of Engineers, Australia
and

Murray-Darling Basin Commission
2001 - The Centenary of Federation